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Special Issue Introduction

Crossing boundaries: Learning and teaching in virtual worlds

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While the concept of multi-user virtual worlds is not new, the rising popularity of virtual world applications has been rapid over the last 5 years, with around 180 Virtual Worlds at present available or under development (de Freitas, 2008). The Virtual Worlds allow users to interact with one another with a greater sense of presence than in video or web conferencing. In addition, three-dimensional worlds allow for a range of activities beyond social meetings and online seminars, eg, interactive activities, quests, mentoring and research collaboration of distributed groups (Prasolova-Førland, 2008).

The emergence of virtual worlds as a teaching and learning tool and environment is a comparatively recent one, stemming largely from a set of socio-technical transitions such as wider access to broadband, the development of powerful technologies and platforms, the emphasis upon social and experiential interactions, and advances in the uses and applications of the internet. These forces have led to greater challenges and opportunities for the learning and teaching communities that may broadly be categorised in terms of social, pedagogic, institutional and technological. The expansive nature of these tools and applications introduces further complexities regarding the impact and implications of virtual worlds for teaching and learning. Specifically, virtual worlds can be used in unique disciplinary contexts and in very broad ways to support general teaching and learning, or research practices and communities. This area of research

and practice presents the community with real challenges. Furthermore, these environments offer potentials, such as:

- re-organising and extending social interactions and collaboration;
- increasing engagement and motivation through greater learner empowerment and participation;
- presenting new opportunities and scope for creativity in learning such as through role plays and mentoring;
- embedding simulations and play to support deeper learning such as undertaking experiments that are difficult to replicate in the real world;
- opening up new learning spaces for rehearsal and exploration, experimentation and design, production, and user-generated content;
- providing broader capabilities for learner-led activity, problem-based and exploratory learning.

Broadly, this potential has been identified in a previous special issue of BJET [40(3)], but as succinctly pointed out by Salmon and Hawkrigde (2009, p. 408) in the introduction [2] for the issue on the use of three-dimensional multi-user virtual environments in higher education,

Noticeably, none of the UK or US papers [discussed] reported a major research project. Many were promotional or even speculative, writing about what might happen in SL [Second Life] rather than what has happened.

In this issue, we have attempted to bring together some of the early emerging studies that are implementing virtual world environments into teaching and learning practices to extend prior work and push forward the main research lines towards a more homogeneous set of discourses, thereby integrating some of the diverse disciplinary perspectives, identifying and testing the varied methodologies and frameworks put forward, and synthesising some of the main lessons from early research in the field.

While it is clear from this special issue (and previous ones) that there are still significant gaps in the research in this field (see for example Hew & Cheung, in this issue), this work collectively represents a substantial advancement over the last 5 years not only in the use of Virtual Worlds for learning and teaching, but importantly in the methods and approaches being used to experiment with, understand, evaluate and validate this usage. The trend towards lists of examples of uses of Virtual Worlds (eg, Kirriemuir, 2008) has given way to real and substantial study of problem-based, exploratory learning and pedagogically driven uses of Virtual Worlds. While there has been an emphasis upon the use of Second Life as a popular example of a virtual world, other virtual worlds are being explored (eg, Whyville, OLIVE) and greater subtlety of themes examined is notable in the papers gathered in this issue. [3]

While one of the key issues in this field has been how to bring together work from such diverse subject areas such as cognitive psychology, computer science, educational technology and the learning sciences, gradually a 'cross-discipline' is emerging that is

allowing different methodologies to be brought together through dialogic forms that were previously difficult to support because of the more silo-based structures of the academy. Although 'interdisciplinarity' and 'cross-disciplinarity' were identified as desirable concepts, the capabilities and infrastructure to actively engage with different disciplines was simply not developed. Over the last 30 years, academic disciplines have been encouraged to engage in, and have re-arranged methods that better facilitate, cross-engagement and cross-collaboration. Challenges faced by the authors with bringing diverse subject groups together have often centred upon methodologies—how do we allow for different methodologies of data collection, analysis and synthesis to be brought together seamlessly? How can we best facilitate collaboration when conceptual stepping-off points (eg, between scientific and social scientific paradigms) are so different?

Towards this end of real cross-disciplinary engagement, this issue was twinned with the First International IEEE Conference on Serious Games and Virtual Worlds, which was held in March 2009 at the University of Coventry, UK. The conference explored how boundaries of disciplines had been traversed and had brought together leading exponents of the field to debate and discuss their work in the light of the considerable challenges set out in this introduction. One of the papers published in the Conference Proceedings (edited by Rebolledo-Mendez, Liarokapis & de Freitas, 2009) is included in this volume (de Freitas *et al.* in this issue), and two papers from that conference are included in a special issue on Visual Computing (edited by Liarokapis, 2009), exemplify the cross-disciplinary nature of the emerging field of research.

Over the next 5 years, we anticipate that further inroads will be made into establishing effective methods for building truly cross-disciplinary methodologies that would help us cross the boundaries between science and humanities, systems and participatory design, formal and informal learning. This issue then, is part of a bigger and ongoing process of bridge-building and seed-planting. Interestingly, at least part of the solution to these challenges may be provided by the subject matter under consideration (ie, educational/learning technologies). Virtual environments offer learning and teaching practitioners, researchers, policy-makers, and developer's real scope and a basic infrastructure for collaboration, not just between disciplines, but also across physical spaces and institutions. The work included in this volume attests to this substantially through an emphasis upon the role of the social at the heart of the virtual interactions.

Virtual worlds and the social

A theme that permeates all papers in this special issue is that of sociability and the capabilities of Virtual Worlds to support groups or communities of learners. The sense of presence inherent in virtual worlds appears to aid engagement and collaboration, and has been identified as having key benefits for education and training purposes. However, the social capabilities of virtual worlds are just beginning to be exploited in educational and training settings. Perhaps, one of the reasons why this is particularly challenging for instructors is how learning is conceptualised. The work of Laurillard

(1993) has shown the importance of dialogue, and the social nature of virtual worlds build upon and extend the dialogic model substantially. Social is not just defined as interactions between individuals and groups, but also between individuals and the spaces they co-construct around themselves. The act of building and producing hence becomes a powerful training and teaching tool supporting socialisation and extending opportunities for conceptual thinking and exploration. The study by de Freitas and colleagues (in this issue), for example, focuses upon the social- and community-building dimension of Virtual Worlds, and how different aspects of the education system may be affected by the transition. In effect, the definition of learning as information regurgitation is giving way to a notion of learning as centring upon 'immersive learning experiences' that are inherently social and collaborative. The key challenge for educationalists here is to respond to a significantly more dynamic and complex learning environment and its associated sets of teaching tools.

Pedagogy and virtual worlds

One of the main pedagogic issues at stake in this debate centres on the kinds of pedagogies implemented in virtual worlds and environments. As is traditionally the case, when new and emerging technologies are adopted and integrated into educational processes, they are implemented and used in traditional and recognisable ways, with linear PowerPoint slides replacing projectors, and blogs replacing personal reflection diaries (Veletsianos, in press). It is not uncommon to see intricate virtual world classrooms where students are asked to sit in rows to passively receive a video or slideshow presentation. To fully understand the possibilities that the tools and environments offer for pedagogy, we need to harness a culture of experimentation, trial-and-error, and creativity, along with a deep understanding of what opportunities virtual worlds offer for teaching and learning. 5

Towards this move for more creative approaches to learning, Dalgarno and Lee (in this issue) review the unique characteristics of virtual worlds, identifying opportunities for researchers and practitioners to use virtual worlds in education in relation to the potential learning benefits they provide, for example, the facilitation of task-centred learning, opportunities for experiential learning, increasing levels of motivation and engagement, the provision of richer and more effective collaborative learning. Viewing technology-enhanced education through an *affordances* lens (Kirschner, Strijbos, Kreijns & Beers, 2004) has gained wide attention in the literature. Virtual worlds offer suggestions for action and design of learning activities and tasks, but it is important to highlight that while these suggestions influence how a technology is used in educational spheres, actual use is not *completely* determined by the technology, and is also shaped by sociocultural forces (Veletsianos, 2009). The spirit of adopting more 'high-risk' learning strategies and inquiry-based learning opportunities, in line with the affordances inherent in virtual worlds, is also demonstrated by Ketelhut and colleagues (in this issue) who outline the implementation of a virtual world where middle-school students collaborated in solving authentic and situated problems related to the emergence of bacteria and disease in a historic town. Empirical results from the investigation are promising, but the notion of appropriating virtual worlds to harness a powerful

pedagogical approach highlights both the power and limits of thinking of technologies in terms of the capabilities that they provide for education. Certainly, the links between pedagogy and the social dimensions of learning need deeper scrutiny and consideration.

Virtual worlds and the institutions

A separate but linked challenge of using virtual worlds has been outlined in the literature and rests upon various disconnections between the institution of the university/school and the use of virtual worlds. This 'disconnect' is multiple and includes:

- infrastructural disconnect (eg, between formal curriculum and informal learning);
- practical disconnect (eg, hours of schooling and durations of play);
- empirical disconnect (eg, between purported benefits and realised outcomes);

One response to these disconnections has been to adopt more collaborative, student-centred and activity-based teaching practices. There is no reason to expect that the gulf between the disconnects cannot be bridged. For example, Hew and Cheung (this issue) in their review paper attempt to bridge the empirical disconnect by reviewing prior literature with respect to (1) how virtual worlds have been utilised, (2) what types of research methods have been used to study virtual worlds, and (3) what research topics have been investigated. While the affordances and opportunities for virtual worlds provide hopes for the use of virtual worlds to empower education, Hew and Cheung note that such opportunities need to be empirically questioned and investigated if institutions are to adopt virtual worlds. It is therefore clear that a concerted effort is required to create the bridges and cross the boundaries between where we are and where we need and want to be. In this respect, academics should ask what purpose universities are fulfilling, how that purpose is changing, how each one of us, individually, can promote the values inherent in education, and how virtual worlds can contribute towards desired goals.

Virtual worlds and the technological advances

The fourth consideration framed in this issue is the technological, which is the sum of the other categories. The technological advances that are occurring at the forefront of the field are situated in the areas around (1) development of tools and frameworks for extending virtual world capabilities, and (2) intelligent and conversational pedagogical agents/avatars. Three papers are included in this issue to outline these contributions.

Bellotti and colleagues in this issue focus on describing the development of tools and processes that allow for the development of re-usable learning tasks that can be embedded across virtual worlds. Their work reduces barriers to enter the virtual world development scene by introducing scalability, flexibility, ease-of-use and cost-effectiveness to virtual world development. Importantly, this development follows on the footsteps of the Web 2.0 world in the sense that technological maturation allows both experts and novices to contribute, participate and create content. While early adopters may experiment with and utilise virtual worlds in their teaching and research endeavours, widespread use is bound to suffer until the development of flexible tools that enable seasoned

users to seamlessly develop in-world content and activities that solve their identified problems. To this extent, Bellotti and colleagues forge a path towards further virtual world adoption.

Veletsianos and colleagues (in this issue) focus on intelligent and conversational pedagogical agents/avatars. This paper outlines a drive that includes a notion of humanistic intelligence, the idea that avatars and agents can integrate an element of intelligence and sociability that can support differentiated learning, personalisation, authenticity and situated cognition (Brown, Collins & Duguid, 1989). Veletsianos and colleagues exemplify the value of multidisciplinary in this area by presenting perspectives from four different disciplines on the design of geriatric avatar-patients in medical simulations, highlighting points of convergence and future research/practice. Falloon and colleagues outline their study and development of an avatar-based authoring program, providing evidence for the power of using these tools for digital story-telling. This area is not without its own controversies. Stemming from such approaches as intelligent tutoring systems, it is clear that the drive is towards socially affable agents that are supportive and guiding of co-constructed learning.

Ultimately, the volume and movement of work around how best to use virtual worlds to support learning and teaching is an ongoing process that has commenced with this work but that goes beyond it into different disciplines. While the work clearly signals the need for the development of the 'cross-discipline' that is not to the exclusion of the disciplinary depth, both are needed. The cross-discipline can provide synthesis for the main findings and outcomes of the disciplinary, allowing lessons to be learnt and fed back into the disciplinary context. In this way, the main argument of the authors is that while this work is important for signalling fertile ground for cross-disciplinary work that brings together new tools and frameworks, and methods and approaches, this is not to the exclusion of a disciplinary emphasis. Virtual Worlds open up new potential for learning and teaching, but present real challenges for researchers and learning practitioners who are attempting to find appropriate and beneficial ways of usage. However, the work included here demonstrates a change in this approach and the beginning of greater criticality and analysis in how virtual worlds are deployed in education.

To conclude, the issue scopes the directions of research and practice in the use and application of virtual worlds for learning and training, however it also signals the beginning of wider adoption of immersive learning strategies, indicating available pedagogies being used, and opening up debate around some of the critical themes and issues emerging. The work is a starting point for future research in the field, capturing the possibilities of virtual world learning not only for supporting social interactions but also for providing an infrastructure for international collaboration and cross-disciplinary within this field and across the academy.

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